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# Can Debt-Reduction Policies Restore Investment and Economic Growth in Highly Indebted Countries?

## A Macroeconomic Framework Applied to Argentina

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Since 1982, public and private investment rates have declined dramatically in most debtor countries. What would be the effects of debt-reduction operations for heavily indebted countries like Argentina?

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This paper — a product of the Debt and International Finance Division, International Economics Department — is part of a larger effort in PRE to investigate the benefits and costs to debtor countries and their creditors of voluntary, market-based debt and debt service reduction arrangements. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Sheilah King-Watson, room S8-040, extension 31047 (33 pages, with tables).

Morisset devised an analytical framework to examine the implications of debt-reduction operations for the economy of a typical middle-income, heavily indebted country.

A major finding is that debt-reduction policies can succeed in restoring investment and, consequently, growth in debtor countries. Such policies combine a liquidity effect resulting from the reduction in debt service payments and an incentive effect resulting from the debt relief.

A simulation designed to analyze the effects of debt-reduction policies in Argentina showed that a 30 percent reduction in debt had a 2.4 percent positive effect on the level of GDP in the first year and a 5.4 percent effect in the fifth year.

The model identifies various channels through which a reduction in foreign debt influences investment. Although the direct effect of debt relief on private investment is relatively weak, the indirect effects through domestic assets are strong.

The prospect of greater stability in the domestic economy increases the demand for domestic assets, particularly bank deposits. This reduces domestic interest rates and increases the supply of credit extended by the domestic financial sector. Both effects have a positive influence on productive investment.

The analysis includes a calculation of the debt-reduction and liquidity combination that maximizes Argentina's GDP. The purpose was to determine the best use of a potential loan to the country from international financial institutions.

The empirical results suggest the tentative conclusion that a Brady Initiative debt and debt service reduction operation could establish the basis for sustainable growth in Argentina, if combined with appropriate domestic policies.



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## Introduction

Since 1982, public and private investment rates have declined dramatically in most debtor countries. For the group of 15 heavily indebted countries, the investment to GDP ratio dropped on average by 6% between 1971-81 and 1982-88 when, for non-crisis countries, this ratio increased in average by 15%[2]. On the basis of this empirical evidence, the poor investment and, consequently, growth performance in highly indebted countries is frequently attributed, at least to some extent, to the burden of their foreign debt.

Basically, the decline in public investment is explained through the cutoff in external financing. The public debt-service payments could not be financed by any new foreign borrowing so that adjustment efforts were concentrated on public investment. Easterly (1989) emphasizes "the adjustment burden in the crisis countries was on the public expenditure side. Capital spending was the most severely cut, falling sharply in Argentina, Brazil, Mexico, Morocco, and the Philippines". Furthermore, the public sector situation worsened, since the governments of debtor countries often felt compelled to assume external liabilities of the private sector. In order to explain the sharp reduction in private investment, the recent economic literature has identified several direct and indirect channels. If the private sector has been also credit rationed, most authors argued that a large foreign debt affects productive investment through a disincentive effect[3]. Since the government in most debtor countries appeared unable (or unwilling) to meet its increasing debt-service payments, private investors anticipated higher rates of taxation on real and financial assets as well as more instability in the economic environment. These changes affected private investment negatively through the debt-overhang effect, which refers to the reduced incentives to invest. In addition, as foreign assets became more attractive relative to domestic assets, this often led to an increase in domestic interest rates, reducing private investment further.

An impressive number of theoretical papers has been carried out during recent years in order to challenge or to assess the validity of the debt overhang hypothesis[4]. There has been, however, relatively few attempts to test empirically this hypothesis. The purpose of this paper is to confront the actual strategy - debt-reduction - with a macroeconomic and dynamic framework that integrates the liquidity and incentive effects. The use of a simultaneous equations model allows to take into account various direct and indirect

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[2]Source : IMF World Economic Outlook, supplementary note 1, 1989.

[3]A disincentive effect may also influence public investment. For instance, a large external debt might discourage the government adjustment efforts, since much of the benefit of adjustment will go to the creditors. We consider, however, that the credit rationing effect is stronger than the disincentive effect on public investment.

[4]see for example Sachs (1989), Krugman (1988), Corden (1989) or Diwan (1990).

relationships between external debt, investment and economic growth. Our assumption is that the impact of a reduction in external debt on growth results from the interactions of a number of mechanisms which are likely to remain unexplained if single-equation approaches are used[5]. More broadly, the paper can be viewed as an attempt to examine if the instruments proposed in the Brady Plan are able to restore growth in debtor countries.

While the resulting model is estimated and simulated for Argentina, it might be applied to other indebted countries as well. Simulation results indicate that investment and, consequently, growth are quite responsive to debt-reduction programs. As a matter of fact, debt-reduction operations produce not only a liquidity effect on public investment through the debt-service reduction but also an incentive effect on private investment through the reduction in the stock of external debt. It appears that this result is not due to the direct impact of debt reduction on private investment, but rather to the portfolio incentive shift from foreign assets into domestic assets which reduces domestic interest rates. The presence of strong potential incentive effects is encouraging because the liquidity effect will be limited in countries like Argentina which are running arrears and are unlikely to obtain any new foreign lending in the short-run.

The paper proceed as follows. The model to be estimated is described in section 1. Section 2 presents the estimation procedure and the estimation results for the case of Argentina. Also, some simulation results are presented and discussed. In section 3, assuming that the International Financial Institutions make available some loans to Argentina for debt-reduction, we attempt to determine empirically the debt reduction-new liquidity combination which fits the best with the preferences of the debtor country. Finally, section 4 contains our conclusions.

## 1. SPECIFICATION OF THE MODEL

The notation and the complete list of variables and equations constituting the model are shown in Appendix 1. The main features of the model can be summarized as following. First, it represents a stylized three sectors model (private, public and financial (banking) sectors) for a small open economy. Second, it attempts to include the most important characteristics of highly indebted countries : high inflation, large fiscal deficits, massive capital flight, huge external debt, high debt service and a relatively developed banking sector. Third, as a clear consensus has emerged in recent years that domestic credit is rationed in LDCs (see Van Wijnbergen (1983),

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[5]For some single-equation estimations of the private investment equation, see for example Cohen (1989), Serven and Solimano (1990), de Melo and Faini (1989) or Hofman and Reisen (1989). To our knowledge, only Borenzstein (1990), Dooley et al. (1990) and Schmidt-Hebbel (1989,1990) used a simultaneous equations framework.

Blejer and Khan (1984) or Fry (1988))[6] and that unrestricted access to international markets is hardly a relevant case for most LDC borrowers, it assumes that the principal constraint on private agent's decisions is the quantity rather than the cost of external and internal resources[7]. Finally, it attempts to reconcile the Tobin-Sidrauski approach with the McKinnon-Shaw arguments in the sense that the contribution of money to economic growth can be positive or negative according to its relationship with productive capital.

## 1.1 the private sector

As a starting point, we consider the following real budget constraint for the private sector :

$$(1)\quad y_d + (\Delta L_p + e\Delta D^{\$}_p)/P = c_p + i_p + (\Delta M1 + \Delta V + \Delta B + e\Delta J^{\$})/P$$

The private sector can accumulate assets into five components : national liquidities ($\Delta M1$), bank deposits ($\Delta V$), capital goods ($i_p$), public bonds ($\Delta B$) and foreign assets ($e\Delta J^{\$}$). Equation (1) states that private expenditure for net accumulation of assets is constrained by the amount of private savings ($y_d - c_p$), the changes in net domestic credit to the private sector extended by the banking system ($\Delta L_p$) and the changes in gross private external debt ($e\Delta D^{\$}_p$).

The real private disposable income ($y_d$) is defined to be GDP plus the earnings on domestic and foreign assets, minus interest paid on external and internal debt and net taxes.

$$(2)\quad y_d = y - t + (i_m - \pi)(V_{-1}/P) + (i_b - \pi)(B_{-1}/P) + (i_f - \pi - e\hat{})(eJ_{-1}/P) - (i_l - \pi)(L_{p-1}/P) - fds_p$$

where $fds_p$ is, on a cash flow basis, the foreign debt service paid by the private sector.

The desired real demands for money, bank deposits, capital, and public bonds and the consumption function can be specified by a standard integrated portfolio model :

$$(3)\quad c^*_p = \alpha_{10} + \alpha_{11}y_d + \alpha_{12}\pi + \alpha_{13}i_m + \alpha_{14}i_b + \alpha_{15}eD^{\$}/P$$

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[6]Note that the rationing in LDCs is justified as a disequilibrium phenomenon caused by legal ceilings on interest rates. By contrast, for developed countries, the argument is based on modern theories of imperfect information (see Blinder (1987) or Stiglitz (1988).

[7]Under rationing, the shadow price of the capital is higher than interest rates and the quantity constraints faced by an agent become therefore arguments in its behavior.

(4) $m1^* = \alpha_{20} + \alpha_{21}y_d + \alpha_{22}\pi + \alpha_{23}i_m + \alpha_{24}i_b + \alpha_{25}eD^s/P$

(5) $v^* = \alpha_{30} + \alpha_{31}y_d + \alpha_{32}\pi + \alpha_{33}i_m + \alpha_{34}i_b + \alpha_{35}eD^s/P$

(6) $u^* = \alpha_{40} + o\ y_d + \alpha_{42}\pi + \alpha_{43}i_m + \alpha_{44}i_b + \alpha_{45}eD^s/P$

(7) $k^*_p = \alpha_{50} + \alpha_{51}y_d + \alpha_{52}\pi + \alpha_{53}i_m + \alpha_{54}i_b + \alpha_{55}eD^s/P$

The demand functions (4)-(5)-(6)-(7) and the consumption function (3) are based on the theoretical arguments proposed by Brainard-Tobin (1968) and Purvis (1978). These authors suggested that desired demands for goods and assets depend essentially on the level of disposable income and the rates of return on alternative assets. We defined the return on bank deposits and public bonds respectively as the nominal interest rate on deposits ($i_m$) and the nominal interest rate on government bonds ($i_b$). We admitted that the demand for capital goods is positively correlated with the inflation rate ($\pi$) as argued by Tobin (1965) and Fischer (1979). Assuming that economic agents refer to domestic conditions rather than to foreign real interest rates, we defined the expected rate of return on foreign assets only with the rate of inflation[8].

We introduced the stock of total foreign debt ($eD^s/P$) into assets demands and consumption function to account for the debt overhang hypothesis[9]. At least five different arguments have been proposed in the recent literature on international debt in order to justify the relationship between the stock of foreign debt and the private sector portfolio behavior.

(i) As households see foreign debt increase, they may well anticipate increased future tax burdens for its servicing and, therefore, they will have an increasing incentive to transfer assets abroad or to consume (Sachs (1989)).

(ii) An increase in the stock of debt increases the instability of the economy which affects negatively private investment and domestic assets demands (Serven and Solimano (1990)).

(iii) The private sector can perceive that a high stock of debt may "goad the government into stimulating exports, which would involve a devaluation in the real exchange rate", thereby increasing capital flight (Fry (1989)).

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[8]This simplification implies that the rate of domestic inflation is a good indicator of the rate of depreciation of the local currency and that variations in domestic inflation are larger than in foreign interest rates.

[9]For example Fry (1988), Schmidt-Hebbel (1989), Cohen (1989), Borensztein (1990), Serven and Solimano (1990) or Greene and Villanueva (1990) used this procedure to estimate LDC investment functions in recent papers. Fry (1989) and Hofman and Reisen (1989) introduced the debt stock into the consumption (savings) function and Cuddington (1988) into the capital flight function. Note that in the empirical part of the paper, alternative debt overhang indicators will be tested.

(iv) When the debt-service payment is linked to the economic performance of the debtor country, this creates a discentive effect to invest or accumulate domestic assets because much of the benefit of adjustment will go the creditors (Krugman (1988)).

(v) An increase in external debt stock could affect negatively the demand for domestic assets because the expected return on foreign and domestic debt may be highly correlated (see Dooley (1990) and Borenzstein (1990)). For example, the debt overhang would generate a premium on the return on public bonds since the government may more likely repay foreign creditors than domestic creditors.

The expected signs for the parameters of equations (3)-(7) are summarized in Table 1.

Assume now that the actual consumption and the actual asset demands do not adjust immediately toward its desired level as a result of adjustment costs :

(8) $c_p - c_{p-1} = \sigma_1(c^*_p - c_{p-1})$

(9) $\Delta ml = \sigma_2(ml^* - ml_{-1})$

(10) $\Delta v = \sigma_3(v^* - v_{-1})$

(11) $\Delta b = \sigma_4(b^* - b_{-1})$

(12) $\Delta k_p = \sigma_5(k^*_p - k_{p-1})$

In order to take into account the existence of liquidity constraints on portfolio's decisions, the speed of adjustment ($\sigma_i$) between desired and actual demands is assumed to vary systematically with the variation in bank credit to the private sector and in gross private external debt[10]. To illustrate this relationship, a linear representation of the speed of adjustment between desired and actual demands for money would be :

(13) $\sigma_2 = \mu_o + [\mu_1 \Delta L_p/P + \mu_2 e \Delta D^{\$}_p/P]/(ml^* - ml_{-1})$

with $\mu_i \geq 0 \quad i=1,2$

This equation states that the speed of adjustment is influenced positively by the total financing available to the private sector measured in relative terms with respect to the size of the discrepancy between desired and actual demands.

Finally, substituting equation (13) into equations (8)-(9)-(10)-(11)-

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[10]This procedure has been used for the investment function by Coen (1971), Blejer and Khan (1984) and Sundarajan (1986).

(12), we can write the following functions[11] :

$$(14)\quad c_p = \beta_{10} + \beta_{11}y_d + \beta_{12}\pi + \beta_{13}i_m + \beta_{14}i_b + \beta_{15}(eD^{\$}/P) + \beta_{16}(\Delta L_p/P) + \beta_{17}(e\Delta D^{\$}_p/P) + \beta_{18}c_{p-1}$$

$$(15)\quad \Delta m1^d = \beta_{20} + \beta_{21}y_d + \beta_{22}\pi + \beta_{23}i_m + \beta_{24}i_b + \beta_{25}(eD^{\$}/P) + \beta_{26}(\Delta L_p/P) + \beta_{27}(e\Delta D^{\$}_p/P) + \beta_{28}m1_{-1}$$

$$(16)\quad \Delta v^d = \beta_{30} + \beta_{31}y_d + \beta_{32}\pi + \beta_{33}i_m + \beta_{34}i_b + \beta_{35}(eD^{\$}/P) + \beta_{36}(\Delta L_p/P) + \beta_{37}(e\Delta D^{\$}_p/P) + \beta_{38}v_{-1}$$

$$(17)\quad \Delta b^d = \beta_{40} + \beta_{41}y_d + \beta_{42}\pi + \beta_{43}i_m + \beta_{44}i_b + \beta_{45}(eD^{\$}/P) + \beta_{46}(\Delta L_p/P) + \beta_{47}(e\Delta D^{\$}_p/P) + \beta_{48}b_{-1}$$

$$(18)\quad i_p = \beta_{50} + \beta_{51}y_d + \beta_{52}\pi + \beta_{53}i_m + \beta_{54}i_b + \beta_{55}(eD^{\$}/P) + \beta_{56}(\Delta L_p/P) + \beta_{57}(e\Delta D^{\$}_p/P) + \beta_{58}k_{p-1}$$

In view of the budget constraint (1), it is clear that the demand for foreign assets ($e\Delta J^{\$}/P$) is determined as well. Once an agent has determined his holdings of any four assets given the level of resources available to him, his demand for the fifth asset has been also defined.

1.2 the banking sector and external sector

The framework (1)-(18) is similar to the one proposed by Tobin-Sidrauski in the sense that money ($\Delta m1$ and $\Delta v$) and real capital are substitutes rather than complements. As a matter of fact, an increase in the demand for bank deposits following high real interest rates should lead to a reduction in investment. This portfolio shift represents the larger attractiveness of holding deposits than productive capital. However, this approach fails to take into account the McKinnon-Shaw hypothesis which assumes a positive relationship between the demand for money and the demand for capital accumulation via the domestic credit to the private sector extended by the banking system. This positive link between money and real investment may be introduced into the model through the budget constraint of the financial sector[12].

The banking system, which is assumed for simplification to integrate the

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[11]Note that $i_p = \Delta k_p - \delta k_{p-1}$

[12]Introducing the budget constraint of the banking sector into the system (1)-(18), we could reconcile the Tobin-Sidrauski arguments and the McKinnon-Shaw hypothesis. A variation (say an increase) in the real interest rates changes, on one hand, the asset portfolio, as assetsholders move out of real investment and foreign assets into national liquidities. On the other hand, the rise in money demand increases the supply of domestic credits to the private sector and, hence, private investment since this sector is assumed to be liquidity constrained (see Morisset (1990).

central bank and commercial banks, accumulates international reserves ($e\Delta R^S$) (which are determined endogenously by the balance of payments (see below)), extends credits to the government ($\Delta L_g$) and to the private sector ($\Delta L_p$) and issues liabilities in the form of money ($\Delta M1^s$) and deposits ($\Delta V^s$) :

$$(19)\ \Delta L_p = \Delta M1^s + \Delta V^s - e\Delta R^S - \Delta L_g - (i_m - \pi)V_{-1} + (i_l - \pi)L_{-1} + (i_f - \pi - e\hat{})eR^S_{-1}$$

The constraint (19) indicates that a rise in money supply must cause, ceteris paribus, an increase in the supply of credit to the private sector, because domestic credit is the primary asset backing the monetary liabilities of the banking system. Note that an increase in government borrowing simply subtracts credit to the private sector. This presentation also emphasizes that the amount of credits to the public sector is not directly controlled by the financial sector. In most developing countries, the amount of credit to the public sector is determined by the demand of the government rather than the supply of the financial system (Easterly (1989)).

Assuming a fixed exchange rate regime[13], the changes in international reserves are determined by the balance of payments identity :

$$(20)\ e\Delta R^S = [e\Delta D^S_p + e\Delta D^S_g + FDI - e\Delta J^S] + [x - im - fds_p - fds_g + (i_f - \pi - e\hat{})eR^S_{-1}]$$

where the first and second terms in parenthesis are the capital account and the current account respectively. The variables $fds_p$ and $fds_g$ are, on a cash flow basis, the actual interests on foreign debt paid by the private and public sectors, x exports, im imports and FDI net foreign direct investment.

Exports are supposed to be a function of GDP, the real exchange rate ($eP^*/P$), the stock of capital held in beginning of period ($k_{-1}$) and the level of foreign GDP ($y^*$), with positive coefficients for all variables. Imports are related negatively to the real exchange rate and positively to domestic output. To incorporate partial adjustment, a lagged dependant variable is included in both equations. The exports and imports equations can therefore be expressed as[14]:

$$(21)\ x = \Theta_0 + \Theta_1(eP^*/P) + \Theta_2 y^* + \Theta_3 k_{-1} + \Theta_4 x_{-1}$$

$$(22)\ im = \Phi_0 + \Phi_1(eP^*/P) + \Phi_2 y + \Phi_3 im_{-1}$$

Actual interest paid on foreign debt ($fds_p$ and $fds_g$) is assumed to be exogenous. In the present situation, the change in foreign debt-service payments is more likely determined by direct negotiations with commercial

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[13]Alternatively , the balance of payments identity can be used to determine the nominal exchange rate (flexible exchange rate regime).

[14]see Haque, Lahiri and Montiel (1990), for such specification.

banks, exogenous to this system, than domestic variables. Note, however, that foreign debt-service payments can become linked to the economic performance of the debtor country as result of the negotiations. In this case, the debt-service payments can be a fraction of GDP (or exports) with the consequence that a part of any increase in production would in fact be devoted to the debt-servicing[15]. This can increase the liquidity constraint of the debtor economy and reduces the initial positive impact on investment and, consequently, growth.

Given that many indebted countries currently runs arrears, the distinction between the contractual and cash flow external debt-service should be clear. We defined the difference between the contractual foreign debt-service (fds*) and the debt-service currently paid by the private ($fds_p$) and public ($fds_g$) sectors as arrears :

(23) $arrears = (fds_p^* + fds_g^*) - (fds_p + fds_g)$

Assuming that the money market clears within the time period under consideration, inflation can be explained by the rate of change in nominal money supply and the determinants of the rate of change in real money demand. The equilibrium condition in the money market (M1) can be expressed :

(24) $M1^s/P = m1^d$

where $M1^s$ is nominal money supply, $m1^d$ real money demand (in stock term) and P the price level. Equation (24) can be rewritten in first difference logarithmic form :

(25) $\pi = \mu - \Delta m1^d/m1$

where $\pi = \Delta \ln P$; $\mu = \Delta \ln(M1^s)$ and $\Delta m1^d/m1 = \Delta \ln(m1)$

As the money market, the bank deposits market is assumed to be in equilibrium :

(26) $V^s/P = v^d$

The interest rate on deposits is determined by equation (26). Note, however, that the authorities often choosed to fixe legal ceilings on domestic interest rates (see Fry (1988)). With $i_m$ exogenous, equation (26) becomes unnecessary since the quantity of money is only determined by the deposits demand of the private sector (equation (16)). Alternatively, the supply of

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[15]As Borenzstein (1990b), we will assume that this fraction is fixed and exogenously determined. This approch does not take into account the possibility that the debtor country can manipulate its production level in order to modify its bargaining position vis-a-vis the creditors, as in Aizenman and Borenzstein (1989). In fact, it is very unlikely that a country will voluntary reduce its production level to negotiate the debt-service repayment (see Polak (1989).

deposits ($V^s$) can be exogenous. In this case, the interest rate on deposits is determined endogenously by equation (26).

1.3 the public sector

The budget constraint of the public sector can be expressed as:

(27) $\Delta L_g/P = i_g + g + (i_b - \pi)B_{-1}/P + fds_g + (i_l - \pi)L_{g-1}/P - t - \Delta B^s/P - e\Delta D^S_g/P$

The public sector can finance its expenditures which consist of purchases of domestic goods for investment ($i_g$) and consumption (g) purposes and interest payments on domestic and foreign debt through taxes (t), sales of public bonds to the private sector ($\Delta B^s$), borrowing from the domestic banking system ($\Delta L_g$) or/and external debt ($e\Delta D^S_g$).

The experience of the last decade indicates that most debt-crisis countries have relied on cutback in public investment. That is why public investment is assumed to be the adjusting variable of the government constraint in the majority of recent papers (e.g. Schmidt-Hebbel (1989)). In order to introduce some flexibility into the model, we assume instead that public investment and credits from the central bank to the government are both endogenous. This results from the observation that recent adjustment programs emphasize the reduction of fiscal deficit in highly indebted countries so that these governments are limited to raise their spending even for investment purposes.

The credits from the central bank are determined by the budget constraint of the public sector[16] (equation (27)) and public investment is specified as :

(28) $i_g = \tau_0 + \tau_1(i_b B_{-1}/P) + \tau_2(fds_g) + \tau_3(e\Delta D^S_g/P) + \tau_4 y_{-1} + \tau_5 i_{g-1}$

where $\tau_{1,2} < 0$ and $\tau_3, \tau_4 > 0$

Equation (28) is based on the arguments proposed by Heller (1975), Mosley (1986) and Nam (1990) which suggested that the composition of revenue sources and expenditures has an impact on government consumption/investment behavior. Of particular interest is how the availability of net foreign borrowing affects public investment. We assume that public investment is

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[16]This presentation emphasizes that most LDC governments have financed their deficits through money creation when they cannot use other sources of financing. "Although LDC government could conceivably experiment with inflationary finance as if were an independently variable, it would generally be more realistic to treat inflationary additions to the money supply as a consequence of fiscal disequilibrium or of the inability or unwillingness to finance growth of exhaustive government expenditures through explicit taxes, the sale of government bonds to the private sector or external borrowing" (von Furstenberg (1983, p.233)).

influenced positively by an increase in taxes, which are correlated positively to lagged GDP level, and in external financing and negatively by a rise in interest payments on internal and external debt.

The public bonds market is assumed to be in equilibrium:

(29) $B^s/P = b^d$

As in the money market, the authorities can administer the bonds market through two alternate instruments : interest rates ceilings and controls on the flow supply of bonds. If either the nominal interest rate on public bonds or the flow supply of bonds is treated as an exogenous variable, the other becomes endogenous. With $r_b$ exogenous, the authorities choose to fixe legal ceilings on domestic interest rates. Equation (29) becomes unnecessary since the quantity of bonds is only determined by the bonds demand of the private sector (equation (17)). Alternatively, the government could choose $\Delta B^s$ exogenously. In this case, the interest rate on bonds is determined endogenously by equation (29).

1.4 remaining equations

In order to analyze the relationship between external debt and growth, we consider a Leontief production function:

(30) $y^s = \min[f(k), g(l)]$

where k is the capital stock at the end of period and l labor utilized during the period.

Under the assumption that capital is the limiting factor, we can write:

(31) $y^s = f(k)$

In order to account for delivery lags in the investment process and for adjustment costs associated with investment[17], we assume that current investment does not necessarily turn into capital within the current period. Increasing investment, holding other inputs constant, may reduce output when the positive contribution to production (delayed by delivery lags) is lower than installation costs. Following Shapiro (1986), the linearized equation for output can be written

(32) $y^s = \Omega_0 + \Omega_1 i_p + \Omega_2 i_g + \Omega_3 k_{p-1} + \Omega_4 k_{g-1}$

with $\Omega_0$, $\Omega_3$ and $\Omega_4 \geq 0$
$\Omega_1$ and $\Omega_2 >$ or $< 0$

Because the characteristics of the public and private sector can be

[17]see Lucas (1967).

different, we separated public and private investment ($i_p$ and $i_g$) and public and private stock of capital in equation (32). An increase in $k_{-1}$ will raise the level of production, but the impact of a variation in current private and public investment remains ambiguous[18].

Finally, the model's dynamic specification is completed with a description of the behavior of the price level, the stock of money, the stock of public bonds, the stock of capital and the stock of private and public gross external debt[19] :

(33) $P = (1 + \pi)P_{-1}$

(34) $M = M_{-1} + \Delta M$

(35) $B = B_{-1} + \Delta B$

(36) $k = (1 - \delta)k_{p-1} + (1 - \delta)k_{g-1} + i_p + i_g$

(37) $eD^{\$} = eD^{\$p-1} + e\Delta D^{\$}_{p} + eD^{\$g-1} + e\Delta D^{\$}_{g}$

1.5 An overview of the model

In summary, the model consists on 8 behavioral relationships and 14 identities (see appendix 1). The analysis incorporates budget constraints and portfolio structure of the private, financial and public sectors and takes into account various interactions between these three sectors. In addition, the relationship between capital and money is explicitly modeled in order to reconcile the arguments of Tobin-Sidrauski with the McKinnon-Shaw hypothesis. The model treats the relationship between nominal and real variables in detail and the dynamics of the model derives primarily from the assets stocks identity and from the dependant lagged variables. Note, however, that some hypothesis have been adopted for simplicity. In particular, the production function is oversimplified and we do not include a parallel exchange rate and foreign equity markets.

Within this framework, we address the critical issue of the role of external debt in highly indebted countries. The impact of external financing policies on domestic variables can be illustrated by considering two simple examples: (i) additional financing to the private sector and (ii) pure public debt-reduction. In order to keep the description as simple as possible, we assume that interest rates are fixed in money and bonds markets, the trade balance is exogenous and the nominal exchange rate is fixed.

The transmission of an increase in private external financing into the

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[18]Using annual data, the impact of a variation in current investment on the level of production is certainly positive. The contribution of the new capital is higher than the costs of adjustment.

[19]To simplify, we assume that there is no principal repayments

domestic economy can be summarized as follows :

(a) The increase in external financing affects assets demands and private consumption. We can distinguish the liquidity and the (dis)incentive effects. The first effect increases the demands for domestic assets and consumption, but the second, due to the rise in future debt, implies a shift from investment, public bonds and bank deposits into consumption and capital flight (equations (14)-(18)).

(b) Higher foreign capital inflow increases international reserves, but this can be reduced through the rise in capital flight (equation (20)).

(c) The changes in assets demands and in international reserves influence the supply of credits to the private sector extended by the banking sector (equation (19)). If the liquidity effect on bank deposits is higher than the discentive effect (equation (16)), the demand for bank deposits increases. As the effect on international reserves is ambiguous, we can assume a rise in the flow of credits.

(d) The release of the liquidity constraint of the private sector increases domestic assets demands and private consumption further. Higher demand for public bonds leads to a reduction in government borrowing from the central bank (equation (27)), thereby increasing domestic credit to the private sector (equation 19)).

(e) The short-term impact on the level of production depends on the variation in private investment (equation (30)). This variable may increase due to the release of the liquidity constraint, but it may be reduced through the debt-overhang effect. Let us assume at this level of the presentation that the total effect on investment and growth is positive.

The transmission of a reduction in the stock of public external debt (at the beginning of period) through debt forgiveness into the domestic economy can be summarized as follows:

(a) The reduction in public external debt-service payments relaxes the government budget constraint which leads to an increase in public investment (equation (26)) and a decline in borrowing from the central bank (equation (27)).

(b) The reduction in public-debt service implies an increase in international reserves through the external constraint (equation (20)).

(c) The decline in the stock of public debt leads to a change in the portfolio of the private sector through the incentive effect (equation (14)-(18)). This effect influences positively the demand for private investment and for domestic assets and negatively the demand for foreign assets and consumption.

(d) The increase in bank deposits and public bonds and the reduction in domestic credits to the government affect positively the flow supply of domestic credits to the private sector (equation (19)). In spite of higher international reserves which reduce the supply of domestic credits, the resulting change in domestic credit is certainly positive.

(e) Higher domestic credit relaxes the liquidity constraint of the private sector and raise the demand for domestic assets, consumption and investment further.

(f) Higher public investment and higher private investment increase the level of production (equation (30)).

Table 2 summarizes the expected effect of a simple public external debt-

reduction and an increase in foreign capital inflow to the private sector on the main endogenous variables of the model. The effects of debt-reduction are probably an underestimate of the full impact, because the improvement in country risk considerations would help attract additional foreign financing and lead to a return of capital flight[20].

## 2. AN EMPIRICAL TEST : ARGENTINA (1962-86)

The model developed in the last section could be used in principle to examine the direct and total effects of a variety of policies on private investment and other endogenous variables of the model. By estimating the model for Argentina and by stimulating it, the response of key variables to changes in foreign debt levels will be derived for this country.

### 2.1 Data and estimation results

The data have been obtained from the International Monetary Fund's International Financial Statistics, the World Bank's reports on Argentina (1985 and 1990), Fundaccion Mediterranea (1984), the Central Bank of Argentina and Dornbusch and de Pablo (1988). All series are described in Appendix 1.

The general framework presented in section 1 was slightly altered to reflect the lack of data of certain variables and some important characteristics of the Argentinean economy. First at all, we were not able to use a consistency approach to measure the economic agents budget constraints over the estimation period. Second, because data on public bonds in hands of the private sector was not available over a long period of time, we assumed that the private sector agents do not hold public bonds in their portfolios. This simplification does not appear excessive in the case of Argentina since, practically, all public bonds issued by the public sector were directly held by commercial banks in recent years. The modified budget constraints of the financial sector and the private sector are presented in Appendix 2. Third, we assume that the interest rate on public bonds is determined by the interest on bank deposits since deposit and public bonds markets are viewed as competitive in a country like Argentina[21]. In other words, these two assets are assumed to be perfect substitutes.

Also, we modified the estimated inflation equation to account for the influence of both international price arbitrage and domestic factors. The estimation procedure has been to substitute money demand equation (equation (15)) into the inflation function (equation (25)) and, then, to introduce external factors into the resulting equation. The presence of both international inflation rate and monetary disequilibrium effects arises because the Argentinean economy was neither completely closed nor opened over

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[20]The model assumes only a reversal of capital flight.

[21]see Santomero and Langohr (1986) for further explanations on this simplification.

the last 30 years (see Mathieson (1982)). Finally, the most general specification was first estimated, and then by dropping insignificant variables, the equation that yield the higher explanatory power ($\bar{R}^2$) was chosen for simulation.

Even if imports were affected by domestic activity and relative prices in Argentina, we assumed that imports are exogenous because tariff and nontariff protection has been the most important factor which influenced the variation in imports over the 1961-86 period. The variable AY (agricultural production to total production ratio) has been introduced into the exports function to capture the impact of shifts in climatic conditions on the exports performance of Argentina. We used the current GDP to trend GDP level ratio ($y/y_T$) rather than disposable income ($y_d$) as explanatory variable of the private investment function. As suggested by Blejer and Khan (1984), private investors are expected to respond more rapidly to changes in private investment when demand conditions are buoyant. In the production function, since there is no data available on the private and the public stock of capital we used the total stock. Finally, we introduced dummy variables into three equations of the model. The variable dum1 represents the liberalization of interest rates from 1977 onward and its positive impact on the demand for bank deposits. The variable dum2 reflects price controls during the 1973-75 period. The variable dum3 captures the large premium between the fixed exchange rate and the free market rate in 1974. The variable dum4 reflects the political and economic uncertainties that dominated during changes in government in 1976 and 1983. The variable dum5 represents the strong increase in real wages during the "Plan Gelbard" in 1974 and 1975 and the variable dum6 reflects the negative impact of the Falklands/Malvinas war in 1982.

In Table 3 we report estimates for Argentina over the 1962-86 period. We used three-stage least squares for all equations, except for the exports and inflation functions which were estimated by two-stage least squares[22]. On the whole, the results are quite satisfactory. The explanatory power ($\bar{R}^2$) and DW statistics are both acceptable, suggesting a good specification of the model. The most interesting aspects of these results concern the incentive and liquidity effects of external debt on domestic variables. Indeed, the estimated coefficients of the stock of debt ($eD^{\$}/P$) appear to be positive on consumption ($dc_p/deD^{\$} = 0.02$) and capital flight ($de\Delta J/deD^{\$} = 0.190$) and negative on private investment ($di_p/deD^{\$} = -0.091$) and bank deposits ($d\Delta v/deD^{\$} = -0.101$). These empirical results validate the debt-overhang arguments presented in section 1. The estimated coefficient of additional foreign resources to the public sector is positive on public investment ($di_g/d\Delta D^{\$}g = 0.294$) and the impact of an increase in public foreign debt-service is negative on public investment ($di_g/dfds_g = -0.4807$). The effect of capital inflow to the private sector seems to be positive on consumption ($dc_p/d\Delta D^{\$}_p = 0.059$) and the demand for bank deposits ($d\Delta v/d\Delta D^{\$}_p = 0.639$), but negative on private investment ($di_p/d\Delta D^{\$}_p = -0.466$). As equations are linearly dependant, we are able to deduct that an increase in private foreign debt led to capital flight during the 1962-86 period in Argentina ($d\Delta J/d\Delta D^{\$}_p = 0.768$).

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[22]We report in Table 3 only the estimations results that have been selected for simulation.

Even if the magnitude of the negative estimated impact of foreign capital inflow on private investment seems doubtful, these results are quite compatible with the Argentine experience. An increase in capital inflow appears to finance capital flight and bank deposits rather than private investment in Argentina (see Morisset (1989)). Note, however, that these estimates include only the direct effect of variations in foreign debt variables and, therefore, they cannot be interpreted as the total effect of such policies (see below for further explanations).

In regressions presented in table 3, we attempt to capture the debt overhang using as an indicator the total stock of external debt over the 1962-86 period. But, one can argue that the disincentive effect of a large stock of debt may be significant only since the beginning of the debt crisis[23]. In order to test this argument, we reestimated the model assuming that the debt overhang did not exist before 1982. In equations (12), (14) and (16) we introduced a multiplicative dummy variable associated to the stock of external debt that takes the value of unity from 1982 onwards and zero in all previous years[24]. On the whole, the estimated results obtained with this alternative measure do not appear significantly different from those presented in table 3. As a matter of fact, the impact of the total stock of debt measured from 1982 is positive on private consumption ($dc_p/deD^{\$} = 0.035$) and capital flight ($de\hat{\Delta}J/deD^{\$} = 0.190$) and negative on private investment ($di_p/deD^{\$} = -0.087$) and bank deposits ($d\hat{\Delta}v/deD^{\$} = -0.072$)[25].

The results pertaining to the other variables also deserve a brief explanation. The estimated coefficient of disposable income is positive on consumption and domestic assets demands. In general, the impact of the inflation rate and the rate of interest corresponds to the one predicted by the theoretical portfolio analysis. The positive relationship between domestic credit to the private sector and private investment and the demand for bank deposits are compatible with a priori expectations since the Argentine private sector has been liquidity constrained. Surprisingly, the coefficient of $\hat{\Delta}Lp$ appears poorly significant on consumption. The estimation of the public investment function and exports function seems to be satisfactory since all parameters have the expected signs. The positive impact of the lagged stock of capital on exports indicates that export volumes respond to changes in supply conditions. The inflation rate is correlated positively and significantly to the nominal growth of money. In addition, external factors appear to have influenced significantly the inflation process in Argentina. The inflation

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[23]see for example Borenzstein (1990)

[24]It is important to note that Fry (1989) suggested that the stock of debt should be introduced into these functions in quadratic form instead of linear form as it is only when debt is superior to a certain level that it can generate a negative incentive effect. But, in the case of Argentina, the empirical results do not appear satisfactory. The coefficient of the stock of debt squared are not significant on most of domestic variables.

[25]On request, all results can be obtained from the author.

rate responded positively to the rate of change in foreign prices and to any departure of the prices to foreign prices. Finally, the production level appears to be influenced positively by private investment and negatively by public investment. This suggests that the costs of adjustment are more important in the public sector than in the private sector. The effect of an increase in the total stock of capital held in the beginning of period is positive and significant on the production level.

## 2.2 Goodness-of-fit

Historical simulations indicated that the goodness-of-fit of the model as a whole is quite good for Argentina over the 1962-86 period. Domestic interest rates and the nominal exchange rate are assumed to be fixed since the government controlled these variables during most of years of the simulation period. Note that we will reverse this assumption in the following section. **Table 4** provides the correlation coefficient between historic and simulated series and Theil's inequality coefficient for the most important endogenous variables. Even if these coefficients indicate that the small structural model is stable and are indicative of its robustness, needless to say, that our simulation results have to be viewed with some care. Actually, they are intended primary as an illustration of the relationship between external debt, investment and growth and not as perfect representation of the Argentine economy.

## 2.3 Total effect of debt reduction and capital inflow on domestic variables

The model can be used as basis for deriving the short-run (1 year) and medium-run (5 years) total response of domestic variables to external debt policies. Since the model is almost linear, the simulation results do not depend strongly of the starting conditions and, moreover, they are not very dependant of the absolute size of the shock. In **Table 5** we report the deviation from the baseline (in terms of elasticity) of the main endogenous variables of the model to a one percentage point decrease in external stock or one percentage point increase in capital inflow[26]. More precisely, we distinguished the effects of four different policies :

(i) A one percent debt write-off without change in the debt-service paid by the public sector,

(ii) A one percent debt write-off with a one percent reduction in the debt-service paid by the public sector,

(iii) A one percent increase in external financing to the private sector

and (iv) a one percent increase in external financing to the public sector.

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[26]Note that, by contrast to historical simulations, interest rates are not assumed to be fixed by authorities in these simulations.

In order to identify the debt overhang effect, a debt-reduction operation is first computed by ignoring the liquidity effect which may arise from the public debt-service reduction. This liquidity effect will be, anyway, limited in countries which are running arrears. The short-term and medium-term simulation results indicate that the real private investment is significantly responsive to external debt changes. To illustrate, an initial 20% debt-reduction leads to an increase in private investment and in the GDP level of 11.7 % and 1.16% respectively (5 years impact). More precisely, a debt-reduction will affect positively the level of private investment through three different incentive channels. First, as private investors see the foreign debt burden decrease, they anticipate reduced future tax burden for its servicing and more stability of the economy. Second, the portfolio shift from foreign assets into domestic bank deposits reduces interest rates. Third, the banking system extends more domestic credit to the private investors since a reduction in the price level increases real money supply[27]. Note, however, that the increase in international reserves reduces simultaneously the flow supply of domestic credit.

The second shock assumes not only an incentive effect but also a liquidity effect. The incentive effect is similar to the one described in the first policy and the liquidity effect arises from the reduction in the foreign debt service paid by the public sector[28]. The release of the budget constraint of the public sector leads simultaneously to an increase in public investment and a reduction in public borrowing from the domestic financial system, therefore lowering the crowding out of domestic credit to the private sector. Higher domestic credit relaxes the private sector budget constraint and increases domestic assets demands and private investment. Note that the positive short-run effect on the production level is relatively weak because the short-run link between public investment and production is negative due to the existence of adjustment costs. However, as the costs of adjustment disappear, the increase in the GDP level becomes progressively higher over time. To illustrate, the estimated total impact of a 20 % debt-reduction is 1.62 % on GDP growth for the first year and 3.60 % for the fifth year. These simulated results are more favorable to debt-reduction operations than those obtained with single-equation approaches. Indeed, the direct and the total effects (in terms of elasticities) on private investment is 0.124 and 1.129 respectively[29]. This comparison suggests that the variations in interest rates and in domestic credits constitute indirect crucial channels through which a debt-relief influences investment and growth in Argentina.

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[27]The decline in the price level comes from the reduction in domestic interest rates, thereby increasing the demand for national liquidities (m1).

[28]We supposed that only the public debt-service is reduced by the debt-relief operation and, therefore, there is no direct liquidity effect in the private sector. Furthermore, we assumed that the public external debt-service is equal to 5 % of the total stock of debt. That means that the reduction in the public debt-service is : $-dfds_g = 0.05*(-deD^{\$})$

[29]source: Schmidt-Hebbel, 1990 p.299, case 6a.

We also simulated additional financing policies because they represent an alternative to debt-reduction operations. Such policies imply a short-run liquidity effect but a medium-run disincentive effect due to the increase in the external debt stock. As the impact of such policies might be different according to the use of external resources, we distinguished additional financing to the private sector and to the public sector. For simplicity, we assumed that debt-service payments are not influenced by additional financing during the first 5 years. Although additional external financing to the private sector relaxes the private sector budget constraint, this policy does not lead to an increase in private investment. The strong total negative impact on private investment is mainly explained by the fact that new foreign resources will be used to finance capital flight rather than productive investment in the case of Argentina. To the opposite of most studies on the relationships between external capital and economic growth, the model does not assume that external funds will be automatically used to finance productive investment. In addition, the decrease in private investment is accentuated through the rise in interest rates and in the stock of external debt (disincentive effect) and through the reduction in the level of production.

Finally, new financing to the government contributes to an increase in public investment and to a reduction in borrowing from the Central Bank which, in turn, leads to an increase in domestic credits to the private sector. These variations affect the GDP level positively in the short-run, but this positive effect gradually diminishes in subsequent years. In spite of the dynamic structure of the model, additional external resources conduct to an increase in the stock of external debt which affects negatively private investment when the initial liquidity effect becomes progressively weaker. It is noteworthy that such policy does not imply a shift in the portfolio of private agents from foreign assets into domestic assets and productive investment. Rather, as the changes in the private sector behavior are mainly due to the increase in the flow supply of credit, the impact of such policy on capital flight is significantly positive.

## 3. A POLICY IMPLICATION : THE EFFICIENT USE OF INTERNATIONAL RESOURCES IN A DEBT-REDUCTION PROGRAM

The simulation results presented in the last section emphasize the effects of debt write-off and additional financing operations on Argentina's economy. Similarly, the macroeconomic framework can be used to evaluate the implications of more realistic policies. In particular, we will consider the case where the International Financial Institutions make available some loans to Argentina for debt-reduction. Because the new foreign funds may be used to finance domestic activities as well as debt-reduction operations, it is necessary to determine the debt-reduction and liquidity combination which fits the best with the preferences of commercial creditors and the debtor country. According to this combination we will estimate the impact of such operation on Argentina's growth.

By introducing the macroeconomic model used in the last section into the

microeconomic analysis proposed by Claessens and Diwan (1990)[30], we will determine empirically the liquidity and debt-reduction combination which leaves the commercial creditors indifferent to the status quo and maximizes Argentina's GDP. Since the approach presented below is an illustration of the Claessens and Diwan's model, the description of it will be brief. We prefer to focus on the empirical results.

Since debt-reduction as well as new money instruments are negotiated simultaneously in the Brady Plan, the following budget constraint can be written:

$$(38)\quad f + n = \Delta(e\Delta D_g) + q[DR + n + f]$$

where f is the new loan made available by the International Financial Institutions, $\Delta(e\Delta D_g)$ the new liquidity used by the government for domestic purposes, q the ex-ante price of debt on the secondary market, DR the net debt-reduction and n the extra new money provides by commercial banks[31].

The budget constraint (38) states that new foreign funds (f + n) can be used by the government to finance domestic activities or debt-reduction through buyback where the buyback price is assumed to be the ex-ante price q[32].

In order to assure that the remaining commercial banks do not lose compared to the status quo situation, Claessens and Diwan assume that the extra new money provided by these banks is equal to the capital gain on their remaining exposure. Thus:

$$(39)\quad (1 - pdebt)n = (pdebt - q)[(\Phi eD^{\$}_{-1}) - DR - n - f]$$

with $\Phi$ = commercial external debt/total external debt

The variable pdebt is defined as the ex-post price of debt on the secondary market. Since several empirical studies indicated a negative and significant relationship between the secondary market price of debt and the face value of debt (see Claessens and Diwan for a summary), we consider the following relationship :

$$(40)\quad pdebt = p_0 + p_1(eD^{\$}/y) + p_2(eD^{\$}/x)$$

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[30]This section can be view as an attempt to reconcile our macroeconomic framework with the microeconomic arguments proposed in the recent literature.

[31]The net debt-reduction is defined as the gross debt-reduction minus the funds made available by the commercial banks and the IFI (f+n).

[32]For simplification, we assume here that all debt-reduction occurs through buyback. But, the analysis can be easily extended to exit bonds (see Claessens and Diwan).

with $p_0 = 0.32857$ , $p_1 = -0.181161$ and $p_2 = -0.0010624$

Note that we used for the parameters $p_1$ and $p_2$ the values estimated by Boehmer and Megginson (1990) and for the intercept $p_0$ the value which assures an initial price of debt equal to 0.20 dollar which is approximately the price of Argentina's debt on the secondary market at the beginning of 1991.

For simplification, we suppose that the debtor country's main objective is to maximize its GDP level. As an illustration, let us assume that the utility function can be represented by the following function:

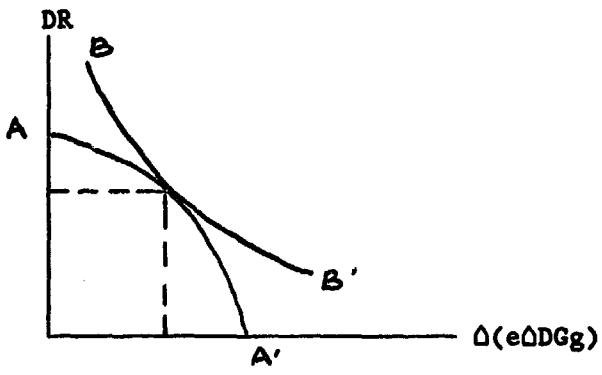
(41) $u(y) = u(DR, e\Delta D_g) = DR^{\alpha} e\Delta D_g^{\beta}$

with $\alpha = 0.041$ and $\beta = 0.023$

where $\alpha$ and $\beta$ are the elasticities of Y with respect to DR and $e\Delta D_g$ respectively. Since the response of GDP to debt-reduction and additional financing have been simulated in section 2, we used the estimated parameters presented in table 5. Note that the value of the parameter $\alpha$ reflects the impact of a debt-reduction on GDP without liquidity effect (first column of Table 5).

In order to determine the optimal combination of debt-reduction and liquidity, we maximize the utility function (41) subject to the constraints (38), (39) and (40). Graphically, this maximization problem is illustrated in figure 1. Substituting equations (40) and (39) into (38), we get the curve AA' which represents the combinations of debt-reduction and liquidity for a given amount of loans f and a given buyback price q. The utility function (41) is illustrated by the curve BB'. Since the curve AA' represents the set of deals that leaves remaining bank creditors indifferent, the debtor country will choose from these possible combinations the debt-reduction and liquidity combination which is tangent to the frontier AA'.

figure 1:




We present in Table 6 the optimal combinations of debt-reduction and

liquidity for different loans make available by the International Financial Institutions to Argentina. Note that the buyback price is US$ 0.20 which is approximately the price of Argentina's debt on the secondary market at the beginning of 1991. On the whole, the results are encouraging. For instance, a US$ 3.2 billion loan from the International Financial Institutions leads to an 1.58 % increase in GDP growth and the ex-post price rises to 0.227 dollar, a 2.27 cents gain compared to the initial price. The positive impact on GDP is quite significant since average GDP growth has been only 0.05% over the 1982-88 period in Argentina. Also, this can be compared to the effects of the 1989 debt-reduction program in Mexico[33]. In a recent paper, Van Wijnbergen (1990) evaluated that the total impact of the 1989 debt-reduction package on Mexico's growth performance will be 1 percentage point initially, and around 2 percentage point after 6 years. But, these results include both the incentive effect and the liquidity effect through the reduction in external debt-service. If we take into account only the incentive effect, the Van Wijnbergen's estimates are approximately 0.4 % for the first year and 1 % for the sixth year while our results for Argentina are 1.58% and 1.81 % respectively.

In summary, the results presented in this section suggest that a debt-reduction program financed by foreign resources can be quite successful to restore investment and growth in the case of Argentina. However, such empirical result should be interpreted with caution. Indeed, the analysis supposes, beyond the limits of the macroeconomic model, that the remaining commercial creditors are indifferent compared to the status quo situation and that Argentina would make an efficient use of the new loans made available by the International Financial Institutions.

## 4. CONCLUSION

An analytical framework has been developed for examining the implications of debt-reduction operations for the economy of a typical middle-income heavily indebted country. Although the model has been estimated and simulated for Argentina, it is quite apparent that it is a specification that is readily to be applied to other developing countries. It could be clearly of interest in some future work to extend our analysis to include data from other countries as well.

The general conclusion that emerges is that debt-reduction policies can be quite successful to restore investment and, consequently, growth in debtor countries. Indeed, such policies combine a liquidity effect resulting from the reduction in debt-service payments and an incentive effect resulting from the debt-relief. To illustrate, the simulation results indicate that, in the case of Argentina, the positive effect of 30 % debt-reduction is 2.43% and 5.40 %

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[33]A US$ 3.2 billions loan to Argentina represents approximately 3.5 % of its 1988 GDP. To compare, the funds made available by the International Financial Institutions to Mexico in 1989 were about US$ 5.3 billions which represented 3.3% of its 1988 GDP.

on the GDP level in the first year and in the fifth year respectively. Because, the liquidity effect should be limited at least in the short-run in countries like Argentina[34], it is noteworthy that the model emphasizes potentially important and significant incentive effects of debt-reduction programs. The model identifies various channels through which a reduction in foreign debt influences investment and, in the process, highlights that, although the direct effect of debt-relief on private investment is relatively weak, the indirect effects through domestic assets demands are strong. The prospect of higher stability in the domestic economy increases the demand for domestic assets and, in particular, the demand for bank deposits. This reduces domestic interest rates and raises the supply of credits extended by the domestic financial sector. Both effects influence positively productive investment. The indirect effect through the domestic credit market relies on the well-known McKinnon-Shaw arguments that state a positive relationship between money and productive capital in most developing countries.

Although the model used in this paper can be improved in many ways, e.g. debt-service payments might be endogenous and the production function is simple, we attempt in the last part of the paper to determine how should be used an eventual loan from the International Financial Institutions to Argentina. By introducing our macroeconomic framework into the microeconomic approach proposed by Claessens and Diwan (1990), we calculated the debt-reduction and liquidity combination which maximizes Argentina's GDP and leaves the remaining commercial banks indifferent compared to the status quo. The empirical results suggest that a Brady Plan operation can establish the basis for sustainable growth in Argentina. This conclusion is of course tentative because there is need for much more detailed research between external debt, investment and growth.

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[34]In the medium-run, we can assume that improvement in country creditworthiness generated by the debt-reduction would help attract additional foreign loans and direct investment.

Table 1:
Expected Signs of the Parameters

| | $y_d$ | $\pi$ | $i_m$ | $i_b$ | $eD^{\$}/P$ |
|---|---|---|---|---|---|
| $c_p$* | $\alpha_{11}>0$ | $\alpha_{12}>0$ | $\alpha_{13}>0$ | $\alpha_{14}>0$ | $\alpha_{15}>0$ |
| m1* | $\alpha_{21}>0$ | $\alpha_{22}<0$ | $\alpha_{23}<0$ | $\alpha_{24}<0$ | $\alpha_{25}>0$ |
| v* | $\alpha_{31}>0$ | $\alpha_{32}<0$ | $\alpha_{33}>0$ | $\alpha_{34}<0$ | $\alpha_{35}<0$ |
| b* | $\alpha_{41}>0$ | $\alpha_{42}<0$ | $\alpha_{43}<0$ | $\alpha_{44}>0$ | $\alpha_{45}<0$ |
| $k^*_p$ | $\alpha_{51}>0$ | $\alpha_{52}>0$ | $\alpha_{53}<0$ | $\alpha_{54}<0$ | $\alpha_{55}<0$ |

Table 2 :
The Impact of a Simple Debt-Reduction and an Increase in Foreign Capital Inflow on Main Macroeconomic Variables

| | d(eD$g-1) < 0 | d(eΔD$p) > 0 |
|---|---|---|
| y | + | + |
| ip | + | + |
| ig | + | 0 |
| ΔR$ | + | + or - |
| ΔLg | - | - |
| ΔLp | + | + |
| eΔJ | - | + |
| cp | - | + |

Table 3:
The Model for Argentina : Estimation Results
(t-statistics are in parenthesis)

$$(12)\ c_p = \underset{(-0.40)}{-0.001} + \underset{(11.99)}{0.537}y_d - \underset{(-6.29)}{0.306(10^{-4})}\pi + \underset{(5.64)}{0.543(10^{-4})}i_m + \underset{(0.22)}{0.059}e\Delta D^{\$}_p/P - \underset{(-1.03)}{0.134}\Delta L_p/P + \underset{(2.97)}{0.020}eD^{\$}/P + \underset{(4.48)}{0.356}c_{p-1}$$
$$R^2 = 0.971,\ DW = 2.01$$

$$(14)\ \Delta v^d = \underset{(-6.46)}{-0.011} + \underset{(10.76)}{0.288}y_d - \underset{(-2.29)}{0.674(10^{-5})}\pi + \underset{(0.73)}{0.409(10^{-5})}i_m + \underset{(3.74)}{0.639}e\Delta D^{\$}_p/P + \underset{(3.71)}{0.354}\Delta L_p/P - \underset{(-5.24)}{0.101}eD^{\$}/P - \underset{(-0.63)}{1.060}v_{-1} + \underset{(4.35)}{0.051}dum1$$
$$R^2 = 0.973,\ DW = 2.30$$

$$(16)\ i_p = \underset{(-5.30)}{-0.025} + \underset{(7.65)}{0.037}(y/y_T) + \underset{(3.91)}{0.109(10^{-4})}\pi - \underset{(-5.10)}{0.302(10^{-4})}i_m - \underset{(-3.67)}{0.466}\Delta eD^{\$}_p/P + \underset{(4.74)}{0.491}\Delta L_p/P - \underset{(-3.99)}{0.091}eD^{\$}/P - \underset{(-0.64)}{0.006}k_{-1}$$
$$R^2 = 0.897,\ DW = 2.08$$

$$(15')\ \pi = \underset{(-1.34)}{-40.469} + \underset{(12.23)}{0.539}\mu + \underset{(2.89)}{18.159}\Delta i_m + \underset{(14.33)}{0.466}\pi_f + \underset{(1.29)}{36.882}(p/p_f)_{-1} - \underset{(-3.61)}{31.674}dum2$$
$$R^2 = 0.994,\ DW = 1.77$$

$$(18)\ x = \underset{(-1.75)}{-0.008} + \underset{(3.20)}{9.421}(eP^*/P) + \underset{(2.72)}{0.013}k_{-1} + \underset{(1.34)}{0.049}ay + \underset{(3.25)}{0.45}x_{-1} + \underset{(2.54)}{0.005}dum3$$
$$R^2 = 0.896,\ DW = 2.48$$

$$(22)\ i_g = \underset{(-1.37)}{-0.002} - \underset{(-2.09)}{0.465}i_bB_{-1}/P - \underset{(-3.06)}{0.487}fds_g + \underset{(1.90)}{0.294}e\Delta D^{\$}_g/P + \underset{(2.06)}{0.038}y_{-1} + \underset{(4.93)}{0.874}i_{g-1}$$
$$R^2 = 0.883,\ DW = 2.13$$

$$(26)\ y^s = \underset{(5.05)}{0.023} + \underset{(2.55)}{1.596}i_p - \underset{(-0.60)}{0.709}i_g + \underset{(12.07)}{0.243}k_{-1} - \underset{(-5.73)}{0.028}dum4 + \underset{(2.17)}{0.011}dum5 - \underset{(-5.17)}{0.035}dum6$$
$$R^2 = 0.921,\ DW = 1.81$$

Table 4:
Comparison between Historic and Simulated Series (1962-86)

| Variables | correlation coefficient | Theil's coefficient |
|---|---|---|
| Δv | 0.829 | 0.323 |
| cp | 0.915 | 0.079 |
| ip | 0.752 | 0.266 |
| ig | 0.937 | 0.108 |
| x | 0.932 | 0.110 |
| y | 0.873 | 0.098 |
| π | 0.997 | 0.053 |
| ΔJ | 0.679 | 0.794 |
| ΔLp | 0.904 | 0.361 |

table 5:
Simulation Results for External Financing Policies on Domestic Variables
Deviations from Baseline in terms of Elasticity

| | debt-reduction without liquidity effect | | debt-reduction with liquidity effect | | additional financing to the private sector | | additional financing to the public sector | |
|---|---|---|---|---|---|---|---|---|
| | 1 year | 5 years | 1 year | 5 years | 1 year | 5 years | 1 year | 5 years |
| ip | 0.476 | 0.584 | 1.129 | 2.159 | -0.928 | -0.097 | 0 397 | 0.210 |
| ig | 0 | 0.208 | 0.725 | 3.134 | 0 | -0.132 | 0.475 | 0.369 |
| cp | 0.018 | 0.022 | -0.0054 | -0.055 | -0.037 | -0.001 | -0.017 | -0.003 |
| Δj | -1.088 | -1.006 | -0.960 | -0.463 | 0.313 | -0.001 | 0.152 | 0.057 |
| y | 0.041 | 0.058 | 0.081 | 0.180 | -0.081 | -0.011 | 0.023 | 0.022 |
| Δv | 0.004 | 0.008 | 0.022 | 0.046 | -0.005 | -0.005 | 0.011 | 0.009 |
| i | -0.047 | -0.112 | -0.266 | -0.678 | 0.064 | 0.031 | -0.140 | -0.07 |
| π | -0.028 | -0.008 | -0.158 | -0.054 | 0.038 | 0.002 | -0.083 | -0.004 |
| Δlp | -0.505 | -0.491 | -0.514 | -0.547 | 0.034 | 0.008 | 0.0255 | -0.013 |
| Δlg | 0 | -0.177 | -0.653 | -1.486 | 0 | -0.113 | -0.973 | 0.315 |
| ΔR/P | 0.936 | 0.875 | 1.120 | 0.716 | 0.068 | -0.006 | 0.184 | -0.038 |

Calculated with 1986 values

Table 6:
The optimal debt-reduction liquidity combination
($ billion, unless otherwise indicated)

| f | 0.6 | 1 | 3.2 | 5 |
|---|---|---|---|---|
| n | 0.164 | 0.237 | 0.463 | 0.423 |
| pdebt | 20.507 | 20.77 | 22.31 | 23.35 |
| DR | 2.072 | 3.166 | 9.438 | 13.690 |
| Δ(ΔD$g) | 0.232 | 0.355 | 1.059 | 1.536 |
| y (%) | 0.347 | 0.531 | 1.582 | 2.300 |

Note : q=0.20, Φ = 0.547

## Appendix 1:

### Definition and Data Sources

The basic sources for the data used in this study are International Financial Statistics (IFS) published by the International Monetary Fund and the Statistical Appendix of the World Bank Country Study :"Argentina : Reforms for Price Stability and Growth" (WB). These sources was augmented, when necessary, by data from the Central Bank of Argentina (BCRA), the "Fundaccion Meditarranea" (FM), FIEL and Dornbusch and de Pablo's study : "Debt and Macroeconomic Instability in Argentina" (DP). All real variables have been deflated by the WPI index (1970=100).

We present in Table 6 the complete model used for Argentina and the definitions of the variables used in this paper with the source of data where relevant. Note, as described in section 2.1, that there are some differences between the general framework proposed in section 1 and the model estimated for Argentina. In particular, the private sector does not hold public bonds and the interest rate on public bonds is implicitely determined through the bank deposits markets. These both assumptions are explained in details in appendix 2. Also we prefered to estimate the inflation rate (equation 15') directly rather than estimate the demand for money (equation 15). Finally, discrepancies in the data prevailed to apply to Argentina a consistency approach for the public and the financial sector budget constraints.

Table 6 :
The Complete Model applied to Argentina and Definition of Variables

Behavioral Equations

Private Consumption

$$c_p = \beta_{10} + \beta_{11}y_d + \beta_{12}\pi + \beta_{13}i_m + \beta_{15}(eD^S/P) + \beta_{16}(\Delta L_p/P) + \beta_{27}(e\Delta D^S_p/P) + \beta_{18}c_{p-1}$$

Inflation

$$\pi = \tau_0 + \tau_1\mu + \tau_2\Delta i_m + \tau_3\pi_f + \tau_4(p/p_f)_{-1} - \tau_5 dum2$$

Bank Deposits demand

$$\Delta v^d = \beta_{30} + \beta_{31}y_d + \beta_{32}\pi + \beta_{33}i_m + \beta_{35}(eD^S/P) + \beta_{36}(\Delta L_p/P) + \beta_{37}(e\Delta D^S_p/P) + \beta_{38}v_{-1} + \beta_{39}dum1$$

Private Investment

$$i_p = \beta_{50} + \beta_{51}(y/y_T) + \beta_{52}\pi + \beta_{53}i_m + \beta_{55}(eD^S/P) + \beta_{56}(\Delta L_p/P) + \beta_{57}(e\Delta D^S_p/P) + \beta_{58}k_{p-1}$$

Exports

$$x = \theta_0 + \theta_1(eP^*/P) + \theta_2 k_{-1} + \theta_3 ay + \theta_4 x_{-1} + \theta_5 dum3$$

Public Investment

$$i_g = \tau_0 + \tau_1(i_b B_{-1}/P) + \tau_2(fds_g) + \tau_3(e\Delta D^S_g/P) + \tau_4 y_{-1} + \tau_5 ig_{-1}$$

Output

$$y^s = \Omega_0 + \Omega_1 i_p + \Omega_2 i_g + \Omega_3 k_{-1} + \Omega_4 dum4 + \Omega_5 dum5 + \Omega_6 dum6$$

Identities :

Disposable income

$$y_d = y - A$$

where $A = t + (i_m - \pi)(V_{-1}/P) + (i_b - \pi)(B_{-1}/P) - (i_l - \pi)(L_{p-1}/P) - fds_p$

Domestic Credit to the Private Sector

$$\Delta L_p = \Delta M1^s + \Delta V^s - \Delta B - e\Delta R^{\$} - \Delta L_g - Z$$

where $Z = (i_m - \pi)V_{-1} + (i_l - \pi)L_{-1} + (i_f - \pi - e\hat{})eR^{\$}_{-1} + i(B_{-1})$

Capital Flight

$$e\Delta J^{\$}/P = y_d + (\Delta L_p + e\Delta D^{\$}_p)/P - c_p - i_p - \Delta m1 - \Delta v$$

Variation in Internat^R
ional Reserves

$$e\Delta R^{\$}/P = [e\Delta D^{\$}_p + e\Delta D^{\$}_g - e\Delta J^{\$}]/P + [x - u]$$

where $u = im + fds_p + fds_g - (i_f - \pi - e\hat{})eR^{\$}_{-}]$

Arrears

$$arrears = (i_f - \pi - e\hat{})eD^{\$}_{-1} - (fds_p + fds_g)$$

Domestic credit to the public sector

$$\Delta L_g/P + \Delta B^s/P = i_g + (i_b - \pi)B_{-1}/P + fds_g + oi$$

where $oi = g + (i_l - \pi)L_{g-1}/P - e\Delta D^{\$}_g - t$

Flow supply of money

$$\Delta M = (\mu M_{-1})$$

Bank deposits market equilibrium

$$Vs/P = v_{-1} + \Delta vd$$

Stock of capital

$$k = (1 - \delta)k_{-1} + i_p + i_g$$

Price level

$$P = (1 + \pi)P_{-1}$$

Stock of external Debt

$$eD^{\$} = eD^{\$p-1} + e\Delta D^{\$}_p + eD^{\$g-1} + e\Delta D^{\$}_g + arrears$$

Definition

$e\Delta J^{\$}$ Capital flight, calculated as ($\Delta eD^{\$}$+FDI+CA-$\Delta$R)

| | |
|---|---|
| $y_d$ | Real disposable income, calculated as $(\Delta m1+\Delta v+\Delta j+c_p+i_p-\Delta l_p-e\Delta D^{\$}_p/P)$ |
| eTB | Trade balance, IFS line 77acd |
| $c_p$ | Real private consumption, IFS line 96f |
| $\Delta m1^d$ | Real money demand (flow), IFS line 34 (changes) |
| $\Delta v$ | Real bank deposits demand (flow), IFS line 35 (changes) |
| $\Delta b^d$ | Real public bonds demand (flow) |
| $i_p$ | Real private investment, IFS lines 93e and 93i |
| $dL_p$ | Variation in domestic credit to the private sector, IFS line 32d (changes) |
| $e\Delta R^{\$}$ | Variation in international reserves, IFS line 79cd |
| arrears | Interest arrears on foreign debt, World Debt Tables (1990) |
| $\Delta V^s$ | Flow supply of bank deposits, IFS line 35 (changes) |
| $i_m$ | Nominal interest rate on deposits, CB |
| $\Delta L_g$ | Variation in domestic credits to the public sector, WB and FM |
| $i_g$ | Real public investment, WB and FIEL |
| $\Delta B^s$ | Flow supply of public bonds, WB and FM |
| $i_b$ | Nominal interest rate on bonds |
| $y^s$ | Real aggregate supply, IFS line 99b |
| k | Real stock of capital, FM |
| $\pi$ | Domestic inflation rate, WB |
| P | Domestic price level (WPI index), WB |
| M1 | Stock of money, IFS line 34 |
| B | Stock of public bonds |
| $eD^{\$}$ | Stock of external debt, World Debt Tables and CB |
| $e\Delta D^{\$}_p$ | Variation in external credit to the private sector, calculates as $\Delta eD^{\$}$- |
| $e\Delta D^{\$}_g$ | $\Delta eD^{\$}_g$ Variation in external credit to the public sector, WB |
| e | Nominal exchange rate, IFS line wf |
| $\pi^*$ | Imported foreign inflation rate, WB |
| G | Public consumption |
| t | Fiscal Revenues |
| x | Exports, WB |
| im | Imports, WB |
| $i_f$ | external debt interest rate |
| $fds_p$ | Interest paid on foreign debt by the private sector |
| $fds_g$ | Interest paid on foreign debt by the public sector |
| P* | foreign GDP deflator (US) |
| $\Delta M1$ | Flow supply of money (M1) |
| $\mu$ | Rate of growth of money ($\Delta M/M$) |
| A | $t + (i_m - \pi)(V_{-1}/P) + (i_b - \pi)(B_{-1}/P) - (i_l - \pi)(L_{p-1}/P) - fds_p$, calculated as $y - y^d$ |
| Z | $(i_m - \pi)V_{-1} + (i_l - \pi)L_{-1} + (i_f - \pi - e\hat{})eR^{\$}_{-1} + i(B_{-1})$, calculated as $\Delta M1^s + \Delta V^s - \Delta B - e\Delta R^{\$} - \Delta L_g - \Delta L_p$ |
| u | $im + fds_p + fds_g - (i_f - \pi - e\hat{})eR^{\$}_{-1}$, calculated as $[e\Delta D^{\$}_p + e\Delta D^{\$}_g - e\Delta J^{\$}]/P + x - e\Delta R^{\$}/P$ |
| oi | $g + (i_l - \pi)L_{g-1}/P - e\Delta D^{\$}_g - t$, calculated as $\Delta L_g/P + \Delta B^s/P - i_g - (i_b - \pi)B_{-1}/P - fds_g$ |
| pdebt | Ex-post price of debt on the secondary market |
| q | Buyback price |
| f | Loan make available by the International Financial Institutions |
| n | New money |

DR Net Debt-reduction
Φ commercial debt/total external debt, World Debt Tables (1990)

APPENDIX 2:

In this appendix we present the financial sector budget constraint, assuming that all public bonds are held by this sector. The nominal budget constraint of the Central Bank is :

(1) $\Delta M1 + (\Delta B^B) + (\text{reserves}) + (i - \pi)(L_{g-1}) + (i^f - \pi)(eR^{\$}_{-1}) - (i_b - \pi)(B^B_{-1}) = (\Delta L_g) + e\Delta R^{\$B}$

where reserves are the commercial banks reserves, $\Delta M1$ the supply of currency, $\Delta B^B$ the remunerated reserves in forms of forced investment or central bank bonds, $\Delta L_g$ the credits from the Central Bank to the public sector and $e\Delta R^{\$B}$ the international reserves held by the Central Bank.

The nominal budget constraint of the commercial banks is :

(2) $\Delta V + (i - \pi)(L_{p-1}) + (i_b - \pi)(B^B_{-1}) + (i_b - \pi)(B_{-1}) - (i_m - \pi)(V_{-1}) + (i_f - \pi)(R^{\$b}_{-1}) = \Delta L_p + \Delta B^B + \Delta B + e\Delta R^{\$b} + (\text{reserves})$

where $\Delta V$ is the supply of banks deposits, $\Delta L_p$ the domestic credit to the private sector, $\Delta B$ the bonds issued by the government and $e\Delta R^{\$b}$ the international reserves held by the commercial banks.

Substituting equation (2) into (1), we get the budget constraint of the financial sector :

$\Delta M1^s + \Delta V^s - (i_m - \pi)V_{-1} + (i - \pi)L_{p-1} + (i - \pi)L_{g-1} + (i_f - \pi - e\hat{})eR^{\$}_{-1} + i_b(B_{-1}) = \Delta L_p + \Delta B + e\Delta R^{\$} + \Delta L_g$

where $e\Delta R^{\$} = e\Delta R^{\$B} + e\Delta R^{\$b}$

Bibliography

Blejer M. and M.S. Khan, "Government Policy and Private Investment in Developing Countries" IMF Staff Papers, vol.31, june 1984
Blinder A. S., "Credit Rationing and Effective Supply", Economic Journal, vol.97, june 1987
Boehmer E. & W. Megginson, "Determinants of secondary Market Prices for Developing Country Syndicated Loans", The Journal of Finance, vol.XLV, n.5, december 1990.
Borensztein E., "Debt Overhang, Debt Reduction and Investment : the Case of Philippines", IMF working paper, june 1990
Brainard W. and J.Tobin, " Pitfalls in Financial Model Building", American Economic Review (AER), LViii(2), 1968
Claessens S. and I. Diwan, "Methodological Issues in Evaluating Debt-Reducing Deals", the World Bank, WPS 408, 1990
Coen R.," The effect of Cash Flow on the Speed of Adjustment", in Tax

Incentives and Capital Spending, G. Fromm (ed), 1971
Cohen D.,"Slow Growth and Large Debt in the Eighties: an Empirical Analysis", CEPREMAP working paper, 1989
Corden M., "Debt Relief and Adjustment Incentives", in J. Frenkel et al. (eds), Analytical Issues in Debt, IMF, 1989
Cuddington J.T., "Macroeconomic Determinants of Capital Flight:An Econometric Investigation", in Capital Flight and Third World, D. Lessard and J. Williamson (eds), Institute for International Economics, Washington D.C., 1987.
Dadkah K. and Kahedi F., " Simultaneous Estimation of Production Functions and Capital Stock for Developing Countries", Review of Economics and Statistics, vol.LXViii, n.3, 1986
de Melo J. & Faini R,"Adjustment, Investment in Developing Countries: An empirical Analysis", Economic Policy, 1990
Diwan I., "Linking Trade and External Debt Strategies", Journal of International Economics, 29, 1990
Dooley M. et al., "Debt Reduction and Economic Activity", Occasionnal Paper N.68, IMF, march 1990
Dornbusch R. , "Mexico : Stabilization, Debt and Growth", Economic Policy, october 1988
Dornbush R. & de Pablo J., "Argentina: Debt and Macroeconomic Instability", The University of Chicago Press, 1988
Easterly W., "Fiscal Adjustment and Deficit Financing during Debt Crisis", in Dealing with the Debt Crisis, 1989
Fischer S.,"Anticipations and Nonneutrality of Money", Journal of Political Economy, vol.87,n.2, april 1979
Fischer S, "Keynes-Wiksell and Neoclassical Models of Money and Growth", American Economic Review, december 1972
Fry M., "Money, Interest, and Banking in Economic Development", The John Hopkins University Press, 1988
Fry M., "Foreign Debt Addiction in Some Developing Countries", Journal of Money and International Finance, 1989
Greene J & D. Villanueva, "Private Investment in Developing Countries: An Empirical Analysis", mimeo, IMF, 1990
Haque N., K. Lahiri & P. Montiel, "A Macroeconometric Model for Developing Countries, IMF Staff papers, september 1990
Heller P.S., "Model of Public Fiscal Behavior in Developing Countries : Aid, Investment, and Taxation", American Economic Review, vol.65, n.3, june 1975
Hofman and Reisen, "Debt Overhang, Liquidity Constraints, and Ajustment Incentives", OECD technical Papers, october 1989
IMF, World Economic Outlook, supplementary Note, 1, 1989
Khan M.S. and P. Montiel, "Growth-Oriented Adjustment Programs : a Conceptual Framework", IMF Staff Papers, june 1989
Koen V., "Testing the Debt Overhang Hypothesis", MIT, july 1989
Krugman P., " Financing vs Forgiving : a Debt Overhang", NBER Working Paper, january 1988
Langhor H. & A. Santomero, "The Impact of Equity in Bank Portfolios", Finance, vol.7, 1986.
Lucas R.E., "Adjustment Costs and the Theory of Supply", Journal of Political Economy, vol.75, 1967
Marquez J., "Foreign Exchange Constraints and Growth Possibilities in LDCs", Journal of Development Economics 19, 1985

Morisset J., "L'affectation du financement externe dans un pays en voie de developpement: un modele de portefeuille", Revue d'Economie Politique, juillet 1989
Morisset J.," Is Financial Liberalization in LDCs really beneficial to private Investment?", working paper, University of Geneva, january 1990
Mosley P.,Hudson J. and Horell S., "Aid, the Public Sector and the Market in Less Developed Countries", Economic Journal, september 1987
Purvis D., "Dynamic Models of Portfolio Behavior : more Pitfalls in Financial Model Building", American Economic Review, 1978
Sachs J. "The Debt Overhang of Developing Countries, in Debt, Stabilization and Development, Oxford: Basil Blackwell,1989
Schmidt-Hebbel, "Foreign Debt, Macroeconomic Adjustment and Growth : Brazil, 1970-88, working paper World Bank, 1989
Serven L. & L. Solimano, "Private Investment and Macroeconomic Adjustment in LDCs: Theory, Country Experiences and Policy Implications", Country Economic Department paper, World Bank, august 1990
Shapiro M., "Investment, Output, and the Cost of Capital", Brookings Papers on Economic Activity, 1, 1986
Sundararajan V., "Debt-Equity Ratio of Firms and the Effectiveness of Interest Rate Policy : Analysis with a Dynamic Model of Savings, Investment, and Growth in Korea", IMF Staff papers, june 1987
Stiglitz J., "Money, Credit and Business Fluctuations", Economic Record, december 1988
Tobin, Money and Economic Growth", Econometrica, 33, october 1965
van Wijnbergen S., "Credit Policy, Inflation and Growth in a Financially Repressed Economy", Journal of Development Economics, vol.13, august 1983.
van Wijnbergen S. "Mexico's External Debt Restructuring in 1989-90", the World Bank, WPS 424, 1990.
von Furstenberg G., "The Uncertain Effects of Inflatianory Finance on Growth in Developing Countries", Public Finance, 1983

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